Statement for the Record

Testimony for

Charles H. Williams, Ph.D.

Associate Professor, Texas Tech University

before the Commerce Subcommittee on Energy and Power

of the House of Representatives

May 13, 1997

Mr. Chairman and members of the subcommittee, my name is Charles H. Williams. I am an associate professor of biochemistry and anesthesiology at Texas Tech University in El Paso. The University's Health Sciences Center is a licensed radioactive user with 57 faculty members who are sub-licensed to employ radioisotopes for various research ventures. I am among those faculty members whose study has benefited from the use of radioisotopes.

In addition to Texas Tech, I represent Advocates for Responsible Disposal in Texas. My views also are shared by Organizations United for Responsible Low-Level Radioactive Waste Solutions, an 18-member coalition dedicated to environmentally, technically and economically responsible disposal solutions for low-level radioactive waste. The American Medical Association, the Society of Nuclear Medicine and the Association of American Medical Colleges are among its members.

I would like to express my gratitude to Chairman Schaefer, Ranking Member Hall-who helped author this bill-and to members of this subcommittee who are committed to establishing a low-level radioactive waste compact for Texas, Vermont and Maine. I also would like to thank members of the Commerce Committee, especially Ranking Member Dingell, as this matter progresses toward an equitable resolution in the House.

I appreciate the subcommittee's invitation to share my personal experiences with radioisotopes and the enormous benefits derived from nuclear medicine. I wish to have my written testimony entered into the Record.

The essence of this hearing is quite simple: Texas, Maine and Vermont deserve the same rights Congress has extended to 41 other states when it approved nine other regional compacts to coordinate disposal of low-level radioactive waste.

The Texas-Maine-Vermont compact is no different. It fulfills obligations of the 1980 Low-Level Radioactive Waste Policy Act by taking responsibility to develop a disposal facility—either individually or in regional interstate agreements-to safely and responsibly manage low-level radioactive waste. Governors and legislatures from each of the states represented in this compact have approved the alliance and are awaiting congressional authorization to solve their low-level waste disposal problems.

Let me be clear on another point. Ratification by Congress of this interstate compact does not address site selection for a disposal facility. The two are separate issues. In fact, only the state of Texas can determine where to designate such a facility.

Radioisotopes Offers Promise in Research, Medical Fields

Mr. Chairman and members of the subcommittee, we live in an age when modern medicine and science push the boundaries of discovery-an age that allows us to harness test-tube antidotes to fight invasive diseases and to perform surgical incisions with gamma knives that bear a marksman's precision. Today, improved screening tests work more rapidly to detect life-threatening and chronic illnesses than in the past. We have radioisotopes to thank for many of those advances.

Radioisotopes are man-made or naturally occurring elements that discharge a ray or energetic particle. This energy travels in three forms: as alpha particles, beta particles or gamma rays. Scientists have found a variety of uses for those radioisotopes in industrial, chemical, medical and agricultural applications.

In agriculture, for example, radioactive materials are used to study plants, develop hardier strains of crops and even improve the quality of the grains in your breakfast cereal. In areas of commerce, radioactive sensors allow quality control workers to detect structural flaws in buildings, bridges, pipelines and airplane fuel tanks. Even the smoke detectors that protect our families as they sleep each night contain radioactive materials.

However, radioactive materials are best known for how they improve our health and quality of life.

In my own field of biochemistry and anesthesiology, I have relied on three radioisotopes-phosphorus-32, tritium and carbon-l&as metabolic tracers in the study of a clinical problem called malignant hyperthermia and separate studies of traumatic shock, also known as septic shock.

In studying malignant hyperthermia, for instance, radioisotopes have furthered my understanding of this disease by enabling me to track how a neurotransmitter-nerve messengers to muscles or cells—metabolizes in the body and how one neurotransmitter, norepinephrine, rises to alarming levels among people affected by this disorder. The disease, which is genetic, is usually triggered by general anesthetics, such as chloroform or ether, and can lead to respiratory failure. If not diagnosed quickly and countered with a drug called dantraline, the disease can be lethal.

Radioisotopes contribute to our burgeoning knowledge of how to develop new drugs, identify which drugs and treatments work best, and manufacture them at a breakneck pace to treat thousands of Americans each year.

Indeed, the National Institutes of Health, the nation's foremost scientific incubator, relies on radioactive materials to conduct almost 80 percent of its research. Not surprisingly, 10 of 15 Nobel Prizes awarded for physiology and medicine in recent years went to men and women whose breakthroughs hinged on research with radioactive materials.

There's a good chance that every one of you sitting on the dais has been touched by one pernicious disease—cancer—in some way. Either you, a member of your family or a friend has fought the disease in some form. According to the American Cancer Society, about half of the men, and one in three women, living today are likely to contract cancer during their lifetimes. But thanks to the advent of nuclear medicine, those touched by cancer are likely to benefit from early detection.

With radioactive techniques like the bone scan, physicians can catch the spread of cancer six to 18 months sooner than X-rays. Once cancer is detected, patients may undergo a series of tests and treatments that owe their success to radioactive materials.

My sister is one example. She was diagnosed with a hyperthyroid disorder. Doctors treated her with radioactive iodine, a drug that kills cancerous cells in the thyroid gland like a selective surgical knife without the invasive trauma of an operation. The treatments cured her and she is undergoing replacement therapy.

Let me provide some more examples to illustrate how patients in the El Paso area have benefited from radioactive medicine:

- At Providence Memorial Hospital in El Paso, patients underwent 440 nuclear medicine and diagnostic therapy procedures during June 1995. Another 134 nuclear cardiology procedures-including cardiac imaging instead of more hazardous cardiac catherizations—were performed during the same period. All told, Providence performs nearly 8,088 nuclear procedures a year.

- At Lubbock General Hospital University Medical Center in Lubbock, Texas, physicians and radiologists have performed 2,595 nuclear medicine procedures during the past 12 months.

- And at R.E. Thomason General Hospital, also in El Paso, 26 procedures involving radioactive medicine were conducted last year.

These procedures were used to combat a host of ailments. Radioisotopes are used to treat thyroid cancer and hyperthyroidism, which you may know as Graves Disease that afflicted former President Bush and his wife, Barbara. The Bushes owe their recovery to radioactive medicine. Radioisotopes also are enablers in treadmill stress tests, scans for the brain, bones and lungs, myocardial perfusion imaging to map blood flow to the heart, and radioactive detection of underactive thyroids in newborns to guard against mental retardation. These procedures are performed countless times at general hospitals in small towns, suburbs and inner cities. They are performed on steel workers, school teachers, social workers and sales executives. In fact, one in three Americans hospitalized this year will be tested or treated with radioactive medical techniques.

Let me stress something: These remedies are not just a single-step process in which a doctor walks up to a shelf, picks up a drug and treats a patient. It takes many years and many steps to move an experimental drug or procedure from the laboratory to the doctor's office. There is a tremendous enterprise involved in the preparation of that drug therapy, from the researchers identifying the most selective drugs to deploy against a particular disease to the pharmaceutical firms manufacturing the drugs. At least 80 percent of the new drugs those firms manufacture will be tested with radioactive materials before they can be approved by the Food and Drug Administration. Up and down the line, these researchers, nuclear therapists and drugmakers produce small amounts of low-level radioactive waste that require proper disposal.

Radioactive Users Bolster State Economy

Let me paint another picture of who produces radioactive materials in Texas and why a compact is crucial to ensuring proper disposal of the low-level radioactive byproducts.

In my state, 2,217 sites hold licenses to possess or use radioisotopes. Of that number, 337 are hospitals, 240 are medical centers and 35 are medical education facilities, like Texas Tech University Health Sciences Center Fifty-seven of Texas Tech's faculty members, including myself, are sublicensed to use radioisotopes in various research and development projects. The other education facilities that I mentioned have similar sublicensing permits.

The remaining licensees are:

- 255 diagnostic and therapeutic nuclear medicine facilities
- 249 facilities licensed for diagnostic nuclear medicine only
- 239 licensees that conduct therapy with unsealed sources
- 130 facilities that conduct therapy with sealed sources
- 29 facilities licensed for external beam therapy
- 18 sites that conduct remote sealed source therapy and
- three facilities that perform gamma knife therapy

As of May 1995, 684 Texas institutions-some of those mentioned above, along with research laboratories and electric utilities-produce low-level radioactive waste. Their byproducts amount to 64,000 cubic feet a year, which is super-compacted to minimize volume. The majority of that waste—97 percent-is Class A low-level waste, the least radioactive. Class B accounts for 1 percent and Class C waste for 2 percent.

For the small degree of waste they produce, licensees contribute to the Texas economy in crucial ways. They inject $16 billion into the state's sales revenue, pay another $2.7 billion in taxes and create 230,000 jobs.

Conclusion

As I have pointed out, the benefits of radioactive materials are shared by all of us-regardless of our station in life, our age or where we live. That's why a low-level radioactive waste compact among Texas, Vermont and Maine is so crucial.

At a time when federal forces are placing a greater strain on state budgets, the compact will enable its members to apportion the cost of building and operating a facility. As the host state for the disposal center, Texas would receive a total of $50 million from Vermont and Maine to further that effort.

When Congress passed the Low-Level Radioactive Waste Policy Act of 1980, it intended to provide for the safe, permanent disposal of the nation's low-level waste by giving states responsibility for disposal capacity. Texas, Vermont and Maine need a compact to further this process and to prevent other states from infringing on their disposal facility. Remember: a state that is not in a compact can be forced to accept waste from throughout the country. Texas, Maine and Vermont should not be penalized for Congress' failure to ratify a compact.

The compact legislation neither designates nor approves a site for this facility. Under the low-level waste law, site selection is the states' responsibility. This bill deals with one issue only: Responsible congressional policy for the disposal of low-level waste.

H.R. 629 is no different from H.R. 558, which the Commerce Committee approved 41-2 in May 1995. A procedural vote on the House floor prevented H.R. 558's passage.

I urge subcommittee members to approve the compact to permit Texas, Maine and Vermont to enjoy the same rights as 41 other states, and to help the states fulfill their congressionally mandated responsibility to dispose of low-level waste. In so doing, Congress will enable citizens in those states to continue receiving the life-saving benefits of radiocative medicine and research.

CURRICULUM VITAE

May 9, 1997

CHARLES H. WILLIAMS, Ph.D.

Soc. Sec. No. 487-40-8978

Personal Data

Address: (Home) 200 Shadow Mountain #75, El Paso. Texas 79912
Phone: (915) 5X1-6087, e-mail:charlesh@flash.net
(Office) Texas Tech University Health Sciences Center
4800 Alberta Avenue El Paso. Texas 79905
Phone: (915) 545-6869 , FAX : 915-545-6656, e-mail: aneechw@ttuhsc.edu

Marital Status: Married: Wife, Dolores B. Vieten, B.S.Ed, UMC 1956
Children: Nathan Charles., B.S.Chem. UMC 1980, M.S.Chem. Purdue U 1983, J.D. UMC 1988
Gregory David., B.A. Math & Economics UMC 1981, J.D. UMC 1984
Rachelle Ann. B.S. Math Ed. UMC 1983

Education

Post-doctoral:

Jan 1979 - Oct 1979
Post-doctoral Fellowship in Toxicology
University of Missouri-Columbia
Department of Entomology
Program Director: Charles 0. Knowles. Ph.D.

Sep 1968 - June 1970
Post-Doctoral Fellowship in Enzymology
University of Wisconsin-Madison
Institute for Enzyme Research
Program Director: David E. Green, Ph.D.

Pre-doctoral:

1963 - 196X
Doctoral Degree
University of Missouri-Columbia
Department of Agricultural Chemistry
Major Area of Concentration: Biochemistry
Minor Areas of Concentration: Physiology and Organic Chemistry

Title of Doctoral Dissertation: *The Effects of the Ovarian Hormones on the Incorporation of Radioactive Phosphorus (^{32}P) into the Phospholipids of the Rat Uterus.* Advisor: Prof. Dennis T. Mayer, Ph.D.

1967
Master's Degree
University of Missouri-Columbia
Department of Agricultural Chemistry
Major Area: Biochemistry
Minor Areas: Physiology and Organic Chemistry.

Title of Master's Thesis: *The Effect of Estradiol-17B, Progesterone, and a Mixture of Both Hormones on phospholipids, DNA, and Phosphate of the Rat Uterus.* Advisor: Prof. Dennis T. Mayer, Ph.D.

1959 | Air Force Personnel School
Lackland Air Force Base. San Antonio, Texas
Curriculum in Administration and Personnel **Supervision**

1953 1957 | Bachelor's Degree
University of Missouri-Columbia
College of Agriculture
Major Area of Concentration: Agricultural Education

Major Research Interests

Mapping the MH gene in swine and humans
Regulation of Metabolism at the Cellular Level
Metabolism of Biogenic Amines
Endocrinology
Genetic Diseases
Effects of Myoncural-Blocking Drugs
Temperature Regulation
Toxicology

Honors and Awards

Who's Who in the South and Southwest. 21th Edition. 1995-1996
Who's Who in the World_ 12th Edition. 1995-1996
International Man of the Year 1992-1993
Biographee. Men of Achievement. Winter 1993. 16th Edition
Biographee, Who's Who in America, 199-l
Biographee. Dictionary of International Biography-23rd Ed (1993).
Elected to Who's Who in South & Southwest. February 1992.
Fulbright Lecturer -Lima. Peru, 1971-San Marcos University Medical School. Department of Physiology & Biochemistry.
American Men and Women of Science: Chemistry
American Men and Women of Science: Medical and Health Sciences
Membership in Honorary Fraternities:
Phi Eta Sigma (Freshmen); Gamma Sigma Delta and Alpha Zeta (Agriculture); Sigma Xi (Science)

Military Service
1958- 1962
(Honorable discharge)
Captain, US Air Force-A03084347

Personnel Officer, 1925th AACS Squadron
Edwards AFB. California

Personnel Officer, AACS Group
Hickam AFB. Hawaii

Headquarters Squadron Section Commander
Pacific Air Force Communications Headquarters
Wheeler AFB, Hawaii

Professional Activities

Formal Professional Activities:

1 Sept 92 (Tenured)	Associate Professor of Biochemistry & Anesthesiology Texas Tech University HSC-RAHC El Paso, TX 79905

Adjunct Associate Professor of Biochemistry, Department of Chemistry. University Texas at El Paso and Member of Senior Graduate Faculty at the University of Texas at El Paso

1 Sept 87-3 1 Aug 92	Director of Surgery Research and Associate Professor of Surgery and Biochemistry (Tenured) Texas Tech University Health Sciences Center - RAHC El Paso. Texas 79905

Adjunct Associate Professor of Biochemistry, Department of Chemistry, University Texas at El Paso and Member of Senior Graduate Faculty at the University of Texas at El Paso

Sept 1982 - 3 1 Aug 87	Director of Anesthesiology Research and Associate Professor of Anesthesiology and Biochemistry (Tenured)
Jun 1982 - Sep 1982	Research Associate Cancer Research Center Business 70 and Garth Ave. Columbia. Missouri
Frb 1981 - Dec 1981	Research Associate Department of Human Nutrition University of Missouri-Columbia Columbia. Missouri
Oct 1979 - Apr 1380	Director of Quality Assurance Medico Industries, Elwood, Kansas
Jan 1979 - Oct 1979	Postdoctoral Research Fellow in Toxicology Department of Entomology University of Missouri-Columbia
Scp 1976 - Dec 1978	Research Associate Sinclair Comparative Medicine Research Farm University of Missouri-Columbia
Jul 1973 - Aug 1976	Associate Professor of Biochemistry and Assistant Professor of Medicine University of Missouri-Columbia

Oct 1970 - Jun 1973	Assistant Professor, Department of Anesthesiology University of Wisconsin-Madison
Jul 1970 - Jun 1972	Assistant Professor, Institute for Enzyme Research, University of Wisconsin-Madison
Apr 1971 - Jun 1971	Fulbright Lecturer, Departments of Biochemistry and Physiology, University of San Marcos. Lima. Peru
Sep 1968 - Jun 1970	Postdoctoral Research Fellow in Enzymology, Institute for Enzyme Research_ University of Wisconsin-Madison
Aug 1963 - Aug 1968	Graduate Research Assistant Department of Agricultural Chemistry University of Missouri-Columbia

Other Professional Activities:

Chairman, Malignant Hyperthermia Symposium American Physiology Society. Niagara Falls, N.Y., October 15. 1985

Member of the American Society of Biological Chemists

Member of the American Physiological Society

Program Project Review Committee Member National Heart, Blood, and Lung Institute

Malignant Hyperthermia Consultant
Malpractice Suit in Florida

Co-Chairman, International Symposium on Pharmacology of Temperature Regulation. Oxford, England - Organized a session on Malignant Hyperthermia 1979

Member. New York Academy of Science

Member. American Association for the Advancement of Science

Post Doctoral Fellows Under my Supervision at The Institute Cur Enzyme Research at University of Wisconsin:

Robert F. Brucker, Ph.D. 1971 - 1973
University of California at La Jolla

Jersey Popinigis, M.D. 1971 - 1972
Department of Physiology and Biochemistry
Academy of Physical Education

Gdansk, Poland

Graduate Faculty. University of Missouri - 1973

Graduate and Medical Students at University of Missouri who worked on the Malignant Hyperthermia Project:

Advisor for Charles W. Gehrke Jr., M.S. Biochemistry, 1974-1976. Graduated from Kansas City Osteopathic School 1980. Entered U.S. Navy as Medical Officer.

Advisor for Jay Yedlin, B.S., Biochemistry, summer research project 1975. entered University of Missouri Medical School - 1975. Now practicing Anesthesiology in Kansas City. Missouri.

Co-Advisor to John J. Eighmy, M.S., Dairy Husbandry, 1977, entered College of Veterinary Medicine, University of Missouri. 1977

Co-Advisor to Thomas P. Davis. Ph.D. Dairy Husbandry, 1978. Now on the staff at the University of Arizona Medical Center. Tucson.

Gaduate and medical students at Texas Tech University HSC who worked on the Malignant Hyperthermia Project:

Advisor to Susan E. Dozier for MS in Chemistry at University of Texas at El Paso. Entered University of Texas Medical School at Galveston on 1 September 1985. Graduated with honors. M.D., on 27 May 1989. Interning at Cornell Medical Center. NYC.

Russell Ray Broadus, a UTEP undergraduate, worked in my labs for two summers (1985-86) and is now enrolled at Southwestern Medical School at Dallas. Tx.

Mariam Marvasti. M.D. (Iran) worked in my laboratories during 1986-87 as a Research Associate and is now a third year resident in Psychiatry (1989). During 1990 she will be the Chief Resident at TTUHSC-RAHC, El Paso.

Alex Tseng, B.S. worked in my labs during 1986-87 on the shock and trauma project and is now enrolled in the TX Osteopathic Medical College at Fort Worth. TX.

Ivan Pinon, M.S. worked in my labs during 1987-88 and is enrolled in New York Medical College.

Debbie Yanez, B.S. worked in my labs during 1987-88 and is enrolled in Graduate School at the University of Wisconsin-Madison.
Marcos Martinez, B.S. worked in my labs during 1989-90, completed the M.S. degree in Biology at UTEP, and will be employed at TX College Ostepathic Medicine in Ft Worth. He has been admitted at TCOM for 1991. Graduated from TCOM and id now doing a Residency at Mayo Clinic. Jacksonville. FL.

Lucy Sierra. MS worked in my labs during 1989 and is now employed at NIH and will pursue the Ph.D. degree while employed there.

Teaching Experience:

1987 to present.	Surgery Resident Review session on research topics.
1983 to 1987	Anesthesiology Resident Review teaching sessions in areas of pharmacology, physiology. and biochemistry related to drugs. metabolism and chemical structures in Anesthesia.
1975 - 1976	University of Missouri-Columbia Department of Biochemistry Associate Professor Course: Biochemistry 193 (a general undergraduate level biochemistry course)
1974 - 1975	University of Missouri-Columbia Department of Biochemistry Associate Professor Course: Biochemistry 322 (carbohydrate metabolism, photosynthesis and regulation of metabolism)
1963 - 1967	University of Missouri-Columbia Department of Agricultural Chemistry Teaching Assistant Course: Agricultural Chemistry 210 (a general undergraduate level biochemistry course)
1962 - 1963	Vandalia Public Schools. Vandalia, Illinois Secondary School Teacher Course: Vocational Agriculture
1957 - 1958	Ainsworth Public Schools, Ainsworth, Nebraska Secondary School Teacher Course: Vocational Agriculture

PATENTS:

US Patent # 5.030.633 awarded on July 9,1991 on *Use of Androstane Derivative Against Malignant Hyperthermia.*

Grants

1997
Urokinase Treatment of Septic Shock. $40.000 from Hardaway Foundation (Phase II, Human Clinical trial)

1997
Urokinase Treatment of Septic Shock $20.000 from Hardaway Foundation. (animal studies)

1996
Urokinase Treatment of Septic Shock. $96.000 from Hardaway Foundation. (animal studies)

1995
Urokinase Treatment of Septic Shock. $34,000 from Hardaway Foundation. (animal studies)

1990

Malignant Hyperthermia Swine Colony, G.P. Hoech, Jr., $1,000 & M. G. Zukaitis, $1,000.

1989

Mapping of the Malignant Hyperthermia Gene in Humans and Susceptible Swine, Texas Higher Education Coordinating Board, Advanced Research/Advanced Technology Program, $623,211 approved. Principal Investigator: Charles H. Williams, Ph.D.

1988

Biogenic Amine Metabolism during Malignant Hyperthermia, NIH, $1,343,340.
Approved (1988).
Principal Investigator: Charles H. Williams, Ph.D.

Malignant Hyperthermia Induction in Susceptible Swine Following Exposure to Organon 9426 & 9616. Biodynamics, Inc. & Organon International b.v. ($97,652.07).
Principal Investigator: Charles H. Williams, Ph.D.

Treatment of ARDS in Human Patients with Urokinase
Abbot Laboratories ($73,000)
Co-Investigator with R.M. Hardaway, M.D.

Long Term Sevoflurane Anesthesia During Trauma Studies
Maruishi Pharmaceutical Co. Ltd. ($40,000)
Principal Investigator: Charles H. Williams, Ph.D.

Therapeutic Treatment of Traumatic Shock and ARDS with TPA
Genentech, Inc. ($50,000)
Co-Investigator with R.M. Hardaway, M.D.

Malignant Hyperthermia Pig Colony
Anesthesia Associates of Kansas City, Inc. ($3,450)

1987 *Autonomic Nervous System and Malignant Hyperthermia*
TTUHSC Seed grant ($5,310)
Co-Investigator with M. Gignone, M.D.

1986 *Arduan and Malignant Hyperthermia*
Biodynamics. Inc. and Organon International b.v. ($50.000)
Principal Investigator: Charles H. Williams. Ph.D.

Laboratory Computer Grant
Anesthesia Associates of Kansas City. Inc. ($6.000)

Travel Grant
Biodynamics, Inc. (61.500)

1985	*Malignant Hyperthermia Symposium* ($9,125 total) RGK Foundation ($4,125) Burroughs Wellcome Co. ($1,000)
	Sevoflurane and Malignant Hyperthermia Biodynamics, Inc. and Maruishi Pharmaceutical Co., Ltd. ($42,500) Principal Investigator: Charles H. Williams. Ph.D.
	Norepinephrine Catabolism in Malignant Hyperthermia Pigs TTUHSC Seed Grant ($6,400) Principal Investigator: Charles H. Williams, Ph.D.
	Malignant Hyperthermia Research Equipment Grant Anesthesia Associates of Kansas City, Inc. ($3,301)
1984	*Calcium Channel Blockers and Muscle Relaxant Interactions* Burroughs Wellcome Co. ($1,000) Co-Investigator with W. Ilias. M.D.
1983	*Vecuronium and Malignant Hyperthermia in Susceptible Pigs* Organon, Inc. West Orange, NJ ($16,000) Co-Investigator with W. Buzello, M.D.
	Malignant Hyperthermia Symposium Marion Laboratories ($1,000) Phillips Roxane ($1,000) Astra Pharmaceutical ($1,000) Norwich Eaton Pharmaceuticals ($1,000) Vital Signs, Inc. ($400)
	Malignant Hyperthermia Pig Colony Anesthesia Associates of Kansas City ($3,000)
19s:	*Malignant Hyperthermia Pig Colony* Anesthesia Associates of Kansas City ($3,000)
1981	*Malignant Hyperthermia Pig Colony* Anesthesia Associates of Kansas City ($3,000)
1979-80	*Studies of Lactate Metabolism in Malignant Hyperthermia Pigs* Co-Investigator with C.M. Trim, D.V.M. UMC Veterinary Research Council ($2,000)
1978-80	*Malignant Hyperthermia Pig Colony* Anesthesia Associates of Kansas City ($3,000 per year)
1979	*International Travel Grant* National Science Foundation ($1,200)
1974-76	*VA Study of Lung Disease* ($53,000 per year) Co-Investigator with K.H. Kilburn, M.D.

1973	*Lamellar Body Ultrastructure and Composition* NIH ($25,000) Principal Investigator: Charles H. Williams, Ph.D.
	Ultra Structure of Mitochondria in situ Wisconsin Heart Assoc. ($4,800) Principal Investigator: Charles H. Williams, Ph.D.
1970-72	*NIH Program Project Grant on Mechanisms of Oxidative Phosphorylation in Mitochondria* NIH ($1,500,000 for five years) Co-Investigator with David E. Green, Ph.D.
1971-72	*Clinical Practice Plan Grant* ($25,000 per year) School of Medicine, UW-Madison Principal Investigator: Charles H. Williams, Ph.D.
1972	*Malignant Hyperthermia Pig Colony* Graduate Research Council UW-Madison ($4,000) Principal Investigator: Charles H. Williams, Ph.D.
1970	*International Travel Grant* American Society of Biological Chemists ($800)
1963-70	*NIH Post Doctoral Fellowship* Institute for Enzyme Research UW-Madison
1965-68	*NIH Pre Doctoral Fellowship* Department of Agricultural Chemistry University of Missouri-Columbia
1963-65	*Research and Teaching Assistantship* Department of Agricultural Chemistry University of Missouri-Columbia

Charles H. Williams, Ph.D. 10

Publications

Books:

Williams CH. *Experimental Malignant Hyperthermia.* New York: Springer Verlag, *1988*

TABLE OF CONTESTS

INVESTIGATIONS
AUTHOR: Peter H. Cribb BSc, MRCVS, Diplomate, ACVA

CHAPTER 11. LABORATORY METHODS FOR MALIGNANT HYPERTHERMIA DIAGNOSIS
AUTHOR: Jeffrey E Fletcher PhD and Henry Rosenberg MD

CHAPTER 12. MALIGNANT HYPERPYREXIA: A REVIEW
AUTHOR: Michael Denborough MD

CHAPTER 13. MALIGNANT HYPERTHERMIA - PRE AND POST DANTROLENE A SURVEY OF THE GREATER KANSAS CITY AREA FROM 1965 - 1985
AUTHORS: Mark G Zukaitis MD, George P Hoech Jr MD, and John D Robinson MD

CHAPTER 14. THE ROLE OF THE SYMPATHETIC NERVOUS SYSTEM IN PATIENTS SUSCEPTIBLE TO MALIGNANT HYPERTHERMIA
AUTHORS: J Hilary Green PhD, Iain T Campbell MD, F Richard Ellis PhD, and P Jane Halsall MS

RUEL W. WILLIAMS, NATHAN T. THOMAS AND THEIR DESCENDANTS IN THE USA, 1669-1991. By Charles H. Williams, published June 1991 at El Paso, TX. 322 pp with 44 illustrations. Printed by Litho Printers, Cassville, MO.

Chapters in *Books*:

1. Taylor CA, Williams CH. Valdivia E. Wakabayashi T. and Green DE. The effect of halothane on energized configurational changes in heart mitochondria in *situ* In: *Cellular Biology and Toxicity of Anesthetics*. edited by BR Fink Baltimore: Williams and Wilkins Company. 1972 pp. 117-127.

2. Williams CH and Vail WJ. The ultrastructural transitions of energized and de-energized mitochondria. In: *Advances in Cell and Molecular Biology. Vol. II*, edited by EJ Dupraw. New York: Academic Press. 1972 pp. 386-406.

3. Williams CH. The isolation of lung lamellar Bodies. In: *Biomembranes: Cells, Organelles, and Membraneous Components: A Volume of Methods in Enzymology*. edited by S Fleischer, L Packer, and RW Estabrook. New York: Academic Press. Vol. XXXI (Part A). 1974 pp. 419-425.

4. Williams CH and Stubbs DH. Preliminary studies on the therapeutic efficiency of phentolamine in the fulminant hyperthermia-stress syndrome. In: *Drugs, Biogenic Amines, and Body Temperature*, edited by P Lomax and E Schonbaum. Basel: Karger, 1976 pp.; 233-234.

5. Davis TP, Gehrke CW Jr., Gerhardt KO, Williams CH, and Gehrke CW, "Pre Column Derivatization. HPLC and Fluorescence Measurement of Biogenic Amines in Biological Materials. In: *Clinical Analysis of Exogenous and Endogenous Constituents by Liquid Chromatography*, L Marton and P Kabra, (eds) CRC Press Inc., Boca Raton, 1984, pp. 53-63.

6. Zukaitis MG, Hoech GP, Williams CH, and Simpson S. Verapamil attenuation of the malignant hyperthermia syndrome in susceptible pigs. In: *Environment, Drugs and Thermoregulation*, edited by P Lomax and E Schonhaum. Basel: Karger 1983 pp. 167-168.

Proceedings (in I'ublishcd Books):

1. Brucker RF. Williams CH. Popinigis J. Galvez TL. Vail WJ. and Taylor CA. Mitochondrial and sarcoplasmic reticulum studies of swine affected with malignant hyperthermia. In: *Proceedings of 1st International Symposium on Malignant Hyperthermia, Toronto*, edited by RA Gordon. BA Britt, and W Kalow. Springfield: Charles C. Thomas, 1973. pp 238-270.

2. Williams CH. Stubbs DH, Shanklin MD, and Hedrick HB, Energy metabolism and hemodynamics in fulminant hyperthermia-stress syndrome swine. In *Proceedings, International Pig Veterinary Society Congress. June 23. 1976.*

3. Williams CH, Houchins C, and Shanklin MD, A preliminary report on energy metabolism in fulminant hyperthermia-porcine stress syndrome in swine. In: *Proceedings of the Focus on Malignant Hyperthermia Symposium, Wausau, Wisconsin, 13 September 1974*, edited by EO Henschel. New York: Appleton-Century-Crofts, 1977, pp. 149-156.

4. Williams CH and Lasley JF, The mode of inheritance of the fulminant hyperthermia-porcine stress syndrome in swine. In: *Proceedings of the Focus on Malignant Hyperthermia Symposium, Wausau, Wisconsin, 13 September 1974*, edited by EO Henschel, New York: Appleton-Century-Crofts, 1977, pp. 141-148.

5. Williams CH. The development of an animal model for the fulminant hyperthermia-porcine stress syndrome. In: *Proceedings of the Focus on Malignant Hyperthermia Symposium, Wausau, Wisconsin, 13 September 1974*, edited by EO Henschel, New York: Appleton-Century-Crofts, 1977. pp. 117-140.

6. Williams CH, Shanklin MD, Hedrick HB, Muhrer ME, Stubbs DH, Krause GF, Payne CG, Benedict JD, and Hutcheson DP, The fulminant hyperthermia-stress syndrome: Genetic aspects, hemodynamic and metabolic measurements in susceptible and normal pig. I": *Proceedings of 2nd International Symposium on Malignant Hyperthermia-Denver, 1-3 April, 1977*, edited by AJ Aldrete and BA Britt. New York: Grune and Stratton. 1978, pp. 113-140.

7. Eighmy JJ, Williams CH, and Anderson RR, The fulminant hyperthermia-stress syndrome: Plasma thyroxine levels in susceptible and normal pigs. In: *Proceedings of 2nd International Symposium on Malignant Hyperthermia-Denver, 1-3 April 1977*, edited by AJ Aldrete and BA Britt, New York: Rune and Stratton. 1978, pp. 161-173.

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64. Williams. C.H., The Future of Medicine_ a presentation to Mrs. Terry Slickinger's Science class at Montwood High School: 1 April 1997 @ 2:50 to 3:40 p.m.

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Exhibits

Experimental Malignant Hyperthermia by Charles H. Williams, Ph.D.
Presented at American Society of Anesthesiologists, Annual Meeting, Las Vegas, Nevada, 17-21 October 1986

Treatment of Adult Respiratory Distress Syndrome with Plasminogen Activators by Robert M. Hardaway, Charles H. Williams. & Yang Sun
Presented at 80th Annual Clinical Congress, American College of Surgeons. Chicago. October 10-13, 1994

Treatment of Traumatic and Septic Shock by R.M. Hardaway, C.H. Williams. and Yang Sun
Presented at the 81st Annual Clinical Congress. American College of Surgeons. New Orleans. October 22-27. 1995.

University-Committee-Service

Chairman -Research Discussion Group Seminar Series between William Beaumont Army Hospital, University of Texas at El Paso and Texas Tech University Health Sciences Center at El Paso, 1983-1986.

Chairman - Laboratory Use Committee at Texas Tech University Health Sciences Center at El Paso 1985 to 1991.

Member - Texas Tech University Health Sciences Center Radiation Safety Committee. 1981 to present.

Member - Texas Tech University Health Sciences Center Radioactive Drug Research Committee. 1991-1992.

Member - Texas Tech University Health Sciences Center Animal Research Committee, 1985 to 1988.

Member - R.E. Thomason Hospital radiation safety committee at El Paso 1985 to 1989.

Chairman. IRB for Human Subjects at El Paso- 1 Sept 1987 to present

Vice-Chairman, Institutional Review Board for Human Subjects at El Paso. 1986-87, member of IRB since 1985.

Newspaper **& Magazine Articles**

Williams, Charles H.. Guest Columnist. *Sierra Blanca is safe for radioactive waste.. El* Paso Times. Sundy, June 11. 1995 p.13A.

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LOW LEVEL RADIOACTIVE WASTE DISPOSAL AT EAGLE FLAT

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18 July 1995 (minor corrections on 9 May 1997)

The following is a complete review of public laws, Texas legislative actions, technical materials, and scientific background for the construction and operation of the low-level radioactive disposal facility at the Eagle Flat-Sierra Blanca Site. The following data and facts clearly support the proposition that Texas needs its own Low-Level Radioactive Disposal Site and that the site at Eagle Flat in Hudspeth County is safe to use..

Why do we need a Low Level Radioisotope Disposal Facility?

There are 2,2 17 total sites within Texas which have licenses to possess or use radioisotopes.
373 hospitals, 240 other medical facilities, and 35 medical education facilities.
255 facilities licensed to conduct diagnostic and therapeutic nuclear medicine,
249 facilities licensed to conduct diagnostic nuclear medicine
239 facilities licensed to conduct therapy with unsealed sources.
130 facilities licensed to conduct therapy with sealed sources,
29 facilities licensed to conduct external beam therapy,
18 facilities licensed to conduct remote sealed source therapy, and
3 facilities licensed to conduct gamma knife therapy.

Providence Memorial Hospital in El Paso, TX this translates into 440 nuclear medicine diagnostic and therapeutic procedures in the month of June 1995, along with 134 nuclear cardiology procedures for the same month. These procedures tally up to about 8,088 nuclear procedures per year.

R. E. Thomason General Hospital in El Paso has performed 26 nuclear medicine procedures in the past 12 months.

Lubbock General Hospital (University Medical Center) in Lubbock, TX has performed 2,595 nuclear medicine procedures during the past 12 months.

The radioisotopes are used for thyroid cancer treatment, hyperthyroidism (Graves Disease), treadmill stress tests, brain scans, bone scans, myocardial infarct scans and heart ejection fraction tests.

Texas Tech University Health Sciences Center has one master radioactive user permit. However, it has issued sub-licenses to 57 faculty members that in turn use radioisotopes in various research and development projects. The other 35 educational institutions have similar sub-licensing programs.

In addition to medical uses of isotopes, industrial uses of isotopes include 881 industrial users,
55 Educational (non-medical) users,
S 1 government (state, local, & civil defense) users,
6 foundations and other healing arts (Chiropractic, Dental, Podiatry, & Veterianary) users.
249 portable/mobile moisture/density guages,
18 1 fixed nuclear guages,
118 industrial radiography guages & instruments,
103 gas chromatographs,
83 X-ray fluoresence (sealed sources),
77 wireline services,
48 tracer studies in oil well exploration and development, paper manufacture,
37 guages for spinning pipe thickness, and
3 Fluoroscopy, hand-held- light intensifiying imaging devices, (lixiscopes).

There are two nuclear powered electric generating plants, Commanche Peak at Glenrose, TX and South Texas Nuclear Project at Baytown, TX. These facilities generate low level radioactive waste consisting of small amounts of radioisotopes filtered out of cooling water. There are pumps, piping, and other machinery parts that must be replaced due to aging and wear, but which are contaminated with radioactive elements and must be disposed of as radioactive materials.

As of May 1995, there are 684 Texas institutions- hospitals, medical research laboratories, universities, and electric utilities that produce low-level radioactive waste. These entities are expected to produce 64,000 cu. ft/yr. of radioactive waste. Because of the high costs for disposal ($240.001 cu. ft.) the material will be super-compacted down to 26,000 cu. ft./yr. Class A waste will account for 97%, Class B waste will be 1% and Class C waste will be 2% of the total amount. The waste producers are shown on the following figure.

What is a radioisotope?

Radioisotopes are naturally occurring or man made chemical elements that spontaneously give off a ray or beam of energy. This energy beam can be in one of three forms:

1) An alpha particle, which is a helium nucleus traveling at about 10,000 miles per second. The alpha particle is easily stopped by a sheet of paper. The helium nucleus picks up an electron and is transformed into a helium atom which then behaves as any other atom of helium in the universe.

2) A beta particle is an electron traveling about 100,000 miles per second. Beta particles are easily stopped by a thin sheet of aluminum foil.

3) A gamma ray is a strong beam of energy traveling at 186,000 miles per second (speed of light). Gamma rays are very penetrating. A foot of concrete or several inches of lead is required to stop gamma rays.

All of these energy beams can cause ionizing radiation damage to living tissues, This means that they destroy chemical bonds in living tissue and thereby wreck cells and their function. Since alpha and beta particles are easily stopped, they do not ordinarily cause tissue damage. Gamma rays, because they are so penetrating, and because they can do so much tissue damage, are the main source of radiation beams that must be controlled and disposed of properly in order to prevent inadvertent injury to humans and other life.

We are all familiar with X-rays used in medicine and dental work. We have microwave ovens for cooking our food which produce non-ionizing radiation These energy beam devices are safe to use with appropriate safeguards and shielding.

With proper disposal, the radioisotope waste generated in Texas can be safely isolated from accidental exposure to humans and other life.

Fortunately, radioisotopes decay at known rates and lose their radioactivity over known time periods. The following table gives the half-life (when the radioisotopes loses 1/2 of its activity) of several radioisotopes used in medicine and research laboratories.

Note that Iodine-l 3 1 used to treat thyroid disease has a half-life of 8.1 days. In ten half-lives (81 days) the radioisotope will decay down to background levels.

Carbon-14 has a half-life of 5,700 years and is used to radiocarbon date fossils, plant and animal material, and underground water supplies. Carbon-14 is also used to trace metabolic pathways in living tissues. Carbon-14, Potassium-40, and Tritium occur naturally and we all have small amounts in our bodies. The largest producer of Tritium is for atomic weapons and nuclear facilities.

Geology at the Eagle Flat-Sierra Blanca Radioactive Disposal Site.

The Eagle Flat site southeast of Sierra Blanca is situated in a basin surrounded by low hills and mountains. The basin is filled with gravel, sand, silt and clay eroded from the surrounding highlands. Analysis of the soil at the site shows that the material is radiocarbon dead indicating that the alluvial flat strata is more than 50,000 years old. The accumulation of calcium carbonate below the Arispe surface indicates that the soil forming processes began 150,000 to 300,000 years ago. ***Calcic soils, paleomagnetic chronostratigraphic boundaries, and stratigraphic horizons that can be projected without offset are all evidence that recognizable fault ruptures have not occurred within the last 780,000 years before the preseni[1].*** Seismic reflection, refraction, and surface wave methods shows that the surface layer is 24 to 58 feet thick, the second layer is 190 to 351 feet thick, and overlies bedrock at depths of 220 to 384 feet.

Core analysis of one hundred twenty three (123) bore holes revealed that sedimentation was started in the basin about 12 million years ago. Gravels and sand have accumulated at the base of a steep slope which infers a normal fault between boreholes YM- 17 and YM-63. There is no evidence from seismic data or cores which indicates that the fault was active from 12 to 5 million years ago. Neither is there evidence of more recent activity at the inferred fault, Grayton Lake, a dry lake bed, appeared about 780,000 years ago and continues to receive waters from Blanca Draw and the surrounding area today. Grayton Lake would have to fill to a depth of 40 feet for surface water to drain directly in the Rio Grande. The normal process is for Grayton Lake to evaporate during the non-rainy season.

There are a number of faults that transect the areas surrounding the Eagle Flat site. However, not a single fault scarp cuts young (Present back to 500,000 years) surficial sediments in the Eagle Flat site. The closest Quaternary fault scarp is 8.4 miles south in Red Light Bolson. The inferred fault comes within 6.5 miles of the Eagle Flat site. Dates of 250,000 to 500,000 years ago and 25,000 to 250,000 years ago can be obtained from calcic soil development for activity at this fault. The average recurrence interval for large surface ruptures is 80,000 to 160,000 years.

The Lobo Valley Basin faults, Mayfield and Sierra Vieja, were nearest the epicenter of the 193 1 Valentine, TX earthquake. This earthquake did not result in surface ruptures. The April 13, 1995 earthquake (magnitude 5.6) 20 miles southeast of Alpine, TX did not affect the Eagle Flat Site. Some rock fall and small rock slides were present in the Alpine area.

Weather Patterns at the Eagle Flat Site.

Raiiall at the Eagle Flat site averages 12 inches per year based on 30 months of on-site data collection. The US Weather Service records 12.31 inches per year at their Sierra Blanca collection point. A check of Chronology Data Vol. 99 #13 and Tech Memo 40 shows a maximum estimated rainfall of 4 inches in a 24 hour period at Sierra Blanca. Rainfall is concentrated between July and October and is usually the result of convective thunderstorms. The evaporation rate is more than 70 inches per year.

The Late Wisconsinan glacial period ended about 14,000 years before present. The desert southwest became warmer and drier with the retreat of the glaciers in Wisconsin. Dry woodlands ofjuniper interspersed with grasslands (depending on rainfall) lasted until about 8,000 years ago. Long lasting hot and dry periods occurred up to 5,000 years ago. From 2,200 years ago the Eagle Flat site has experienced the current arid regime of today. The chances for any appreciable flooding of the Eagle Flat site will be minimized by the 30 ft. high berm that will enclose the completed facility. Thus only water falling on the site will accumulate and drain into the storage ponds where it will evaporate at a later date.

Facility Description and Design

There are three classifications of radioactive wastes: A, B, and C. These classifications are based on the content of radioisotopes, with Class A being the shortest-lived and faster decaying isotopes. Class B waste is more hazardous and most of it will come from nuclear reactors. Class C waste is the most hazardous and must be handled and stored appropriately. These various classes will be separated into diierent storage trenches at the disposal site (see Facility Plan). Liquid wastes will not be accepted for burial at the Low-Level Radioisotope Disposal Site. All waste must be in solid form.

All waste will be placed in cylindrical, steel-reinforced concrete canisters (barrels) that are 13.5 inches thick at the top and bottom with 10 inch thick side walls. After the material is stored in the barrel, the top will be filled with fresh concrete grout, the lid poured inplace and placed in the burial trench. This storage method exceeds all current federal and state regulations for entombment and safety. The barrels are designed to last 500 years or more and to withstand a Richter scale 6.5 earthquake.

The filled barrels will be placed in a 40 ft. deep trench, backfilled with gravel, then capped with a 16 ft. thick engineered cap to prevent rainfall from entering the disposal trench. Test wells will be installed so that the burial trench can be monitored for leakage at any time in the future. The modular design will allow for easy retrieval and correction of any leakage.

Transportation of Low-Level Waste to the disposal site.

Most of the waste will arrive at the site by long haul trucks manned by highly qualified drivers. The close proximity to M-10 (an interchange overpass is to be constructed) will allow trucks to enter and leave M-10 without impeding normal traffic flow. Two railroads that run through Sierra Blanca will also be available for rail shipments if required. Over 15,000 truck load shipments of low-level wastes have been made in the past without exposure of humans to radiation due to accidents. Texas is currently shipping its waste to Barnwell, SC.

Economic Benefits of the disposal facility

It is estimated that 132 construction workers will be needed to build the facility at a total payroll of 1.8 million dollars in salaries over a nine-month period.

The operating unit will require the employment of 33 full-time people. These employees will generate a 1.1 million dollar payroll each year. If former Mayor Jonathan Rogers is correct on his Bank of the West television ads, then this payroll will spin over into the Sierra Blanca economy to the rate of 7.7 million dollars. Some of that money could flow to El Paso for food, clothing, cars, and concrete canisters.

The inclusion of Maine and Vermont into the interstate compact for the construction and operation of the disposal site will generate 25 million dollars in initial startup moneys. A compact between Maine, Vermont and Texas is necessary to restrict the use of the disposal site to those three states. If Texas builds and operates the site by itself, then it is subject to the laws of interstate commerce and anyone in the USA can ship their waste to Texas for disposal.

Potential revenues of $6,240,000.00 each year (26,000 cu. A. at $240.00 /cu. A) can be anticipated for disposal site operation. Hudspeth County is slated to receive 10% of the revenues in lieu of taxes on the facility. These revenues should make the facility self-sustaining over the expected lifetime of 30 years. Texas has already invested over 30 million dollars in the background studies required to select and qualify the Eagle Flat site. Hudspeth County will have received $1,912,780 by August 1995 as their share of the planning and development fees.

My review of all the geological evidence contained in five geology reports strongly indicate that the selected site at Eagle Flat is stable and not subject to earthquakes. The area has been quiescent for the past 780,000 years. The rainfall is about 10 inches per year so the possibility of water contamination is very low and the deterioration of the concrete barrels is very unlikely. Problems with floods are virtually non-existent. The ground water is very old (30,000 to 60,000 years old) and does not move at any measurable rate into the Rio Grande. Travel times of 19,134 years to 43,619 years was estimated from the Eagle Flat site to the Rio Grande. At Eagle Flat (Faskin Ranch) Carbon- 14 is less than 8pmc down to 1.5 pmc with Tritium values at zero indiccating no recent recharge through the basin floor. The ground water is not used for city water. Sierra Blanca obtains its city water by pipeline from Van Horn, TX. The area is isolated from any large population centers, but is still accessible by interstate highway and rail connections. Therefore, I must conclude that the construction and operation of the low-level radioactive waste disposal facility at Eagle Flat (Faskin Ranch) is appropriate and safe for all users in Texas. Location of the site in Hudspeth County is appropriate due to the arid climate, the stable geology, and the isolation of the facility at suitable distance from large population centers. The disposal site will not pose any threat to the local population since the concrete canister, by itself, can stop gamma ray emissions. Burying the canisters 40 A. underground will add an additional measure of protection that will prevent any ionizing radiation from reaching the surface of the ground.

Texas has been shipping low level waste to Bamwell, SC for the past twenty three years.
In 1990-5642 cu.ft,
1991-44660 cu. A.,
1992-48669 cu. ft.,
1993-9801 cu. A. and
1994-5879 cu. ft. were shipped to Bamwell, SC from Texas.
Big shippers to Bamwell were US Army, US air Force, and the wo nuclear power plants

The Bamwell Facility was closed to outside shippers on 1 July 1994. However, it has now reopened temporarily for a two year period. Texas can not rely on continued access to the Bamwell Disposal Facility so the Eagle Flat Site at Sierra Blanca must be developed and placed into operation in the near future, preferably within one year. The licensing application (Revision 9- 1 Mar 1995) is being reviewed by the Texas Natural Resource Conservation Committee and an approval or denial of the license application is expected by April 1, 1996. Recent correspondence indicates that the formal review by TNRCC may be completed by November 1995. Construction and operation of the Eagle Flat Low-Level Radioactive Disposal Site will provide for the responsible disposal of radioactive waste in Texas. It will be of benefit to all residents of Texas, including those in West Texas.

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LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT IN TEXAS

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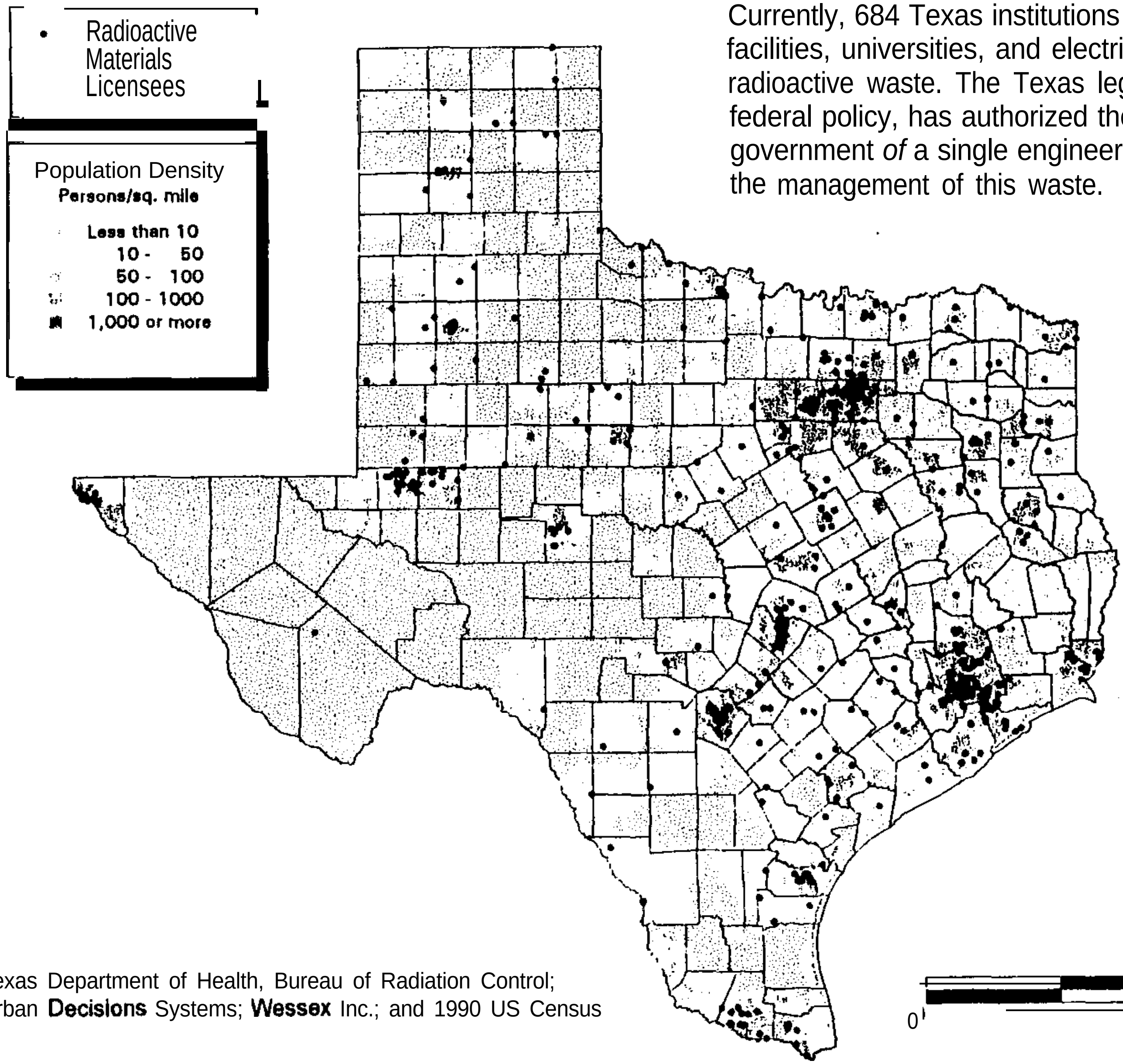
Low -Level Radioactive Waste Producers in Texas- May 1995

Currently, 684 Texas institutions - hospitals, medical research facilities, universities, and electric utilites - produce low-level radioactive waste. The Texas legislature, in keeping with federal policy, has authorized the development by Texas state government *of* a single engineered facility at a remote site for the management of this waste.



Sources: Texas Department of Health, Bureau of Radiation Control; Urban **Decisions** Systems; **Wessex** Inc.; and 1990 US Census